THURSDAY, DECEMBER 5, 1878

BOTANICAL CHEMISTRY

The Organic Constituents of Plants and Vegetable Substances and their Chemical Analysis. By Dr. G. C. Wittstein. Authorised Translation from the German Original, Enlarged with numerous Additions, by Baron Ferd. von Mueller, F.R.S. (Melbourne: McCarron, Bird and Co., 1878.)

MANY who have been interested in botanical studies may have been struck with the varied nature and great number of chemical substances which are extracted from plants and which in many cases impart to the flowers their special and characteristic brilliant colours. Up to the present time we have had in English no work which has devoted itself specially to the systematic description of the nature and preparation of such substances; and the literature in connection with the subject, which is by no means meagre, with accounts of investigations in chemico-botanical research must be sought for in journals generally devoted to purely chemical matter, and consequently less likely to attract the attention or be available for the use of the more general reader.

With regard to other countries, however, this has not been the case, as we find a considerable portion of the work of Berzelius devoted to a consideration of the bodies found in plants, and the "Anleitung zur Analyse von Pflanzen und Pflanzentheilen" of Rochleder has long been known both in Germany and elsewhere as affording a good collection of the results of investigations in vegetable chemistry up to the date of its publication about the year 1858.

During the last year, however, Baron Ferd. von Mueller has brought forward a translation of Dr. G. Wittstein's "Anleitung zur chemischen Analyse von Pflanzentheilen auf ihre organischen Bestandtheile," published in 1868, the value of which he has found in his own researches, and which he has for some time wished to render available for English readers.

The present edition consists of two parts, each divided into three divisions, which form as it were the chapters. In the first part the author has placed the consideration of the proximate constituents of plants and vegetable substances as far as hitherto known, together with their properties and mode of extraction. His first intention in the arrangement of this part, which is naturally the largest portion of the work, was to adopt as far as possible a systematic classification. From the imperfect state of knowledge, however, as to the exact constitution of the bodies, and from the fact also that some of the better known substances possess properties which might cause them to appear in several groups if a classification depending on natural properties was taken, he has finally adopted an alphabetical order and has thus formed a dictionary of so-called phytochemical substances.

In the consideration of the individual substances Baron von Mueller has evidently confined himself almost entirely to their preparation from natural sources, and we have therefore no description of the very interesting and remarkable synthetical methods which are now employed for the production of certain of these bodies. This may of course have been beyond the limit originally intended by the present editor, but we should hope in the event of future editions to have some mention made of the more important recent investigations in this direction. The two latter divisions of the first part are occupied with a synopsis of the plants which yield the bodies previously described and a list of the plants indicated, systematically arranged in their different natural orders. The first of these lists is remarkably good, as it gives not only the names of the plants and those of the substances which they yield, but also the various parts of the plant from which these latter may be extracted. The want of such a list has been felt, and this part of the work might have been extended to rather wider limits; in its present form, however, it will still prove of considerable use. In assigning chemical formulæ to the substances described in the first part of the book the editor has retained the older forms of notation, but has introduced immediately after the alphabetical list of bodies a table containing the molecular weights of the compounds described according to the modern views adopted by chemists; this necessity for two lists concerning the same thing introduces confusion in the mind of the reader, and it would be well therefore in a future edition to dispense altogether with the older forms of molecular weights as they are little used at the present day.

The second part of the work is devoted to the apparatus and reagents necessary for phyto-chemical analysis and to the description of a systematic course embracing the different methods of procedure in conducting such researches. In these analyses one of the most important points is the proper extraction of the various ingredients of the plant; for this purpose solvents such as ether, alcohol, and water are employed. As at first sight it might appear immaterial in what order these solvents are to be used the author points out the importance of employing them in the following order: first ether, then alcohol, and finally water, and by this means preventing such bodies as wax or fat which are completely and entirely dissolved by ether, from passing also into the alcoholic extract in which they are only partially soluble. This also would apply to the extraction of certain of the alkaloids, as in their case partial separation may be carried out in their extraction by the different solvents.

It is to be regretted that the more modern names and atomic weights are not employed in this portion of the work, and also in the description of the preparation of reagents; thus, we find the molecular weight of calcium carbonate given as 625, and that of calcium oxalate as 1025: at the present time the use of such numbers tends greatly to confuse the student.

At the end of the work Baron von Mueller has arranged some useful tables, comprehending the comparison of Centigrade and Fahrenheit thermometric scales, the specific gravity of alcohol of different percentages by weight and by volume, the relation between cubic centimetres and cubic inches, between litres and fluid ounces, and a table of the atomic and molecular weights of the principal elementary bodies.

There can be little doubt that this work supplies a great want in chemical and botanical literature, but there is still room both for the farther elaboration of the matter discussed, and, in certain cases, for some

improvement in the rendering into English of the matter already employed. In the direction of chemico-botanical research there is great room for investigation, and a text-book embracing the knowledge already acquired, and information on points in connection with the chemistry of vegetable physiology, would render such a work of interest not only to the scientific chemist or botanist, but also to the general reader. Baron von Mueller's translation forms an excellent nucleus for such a work, and should a future edition of the book be required, we should hope to find it enlarged in such directions.

J. M. T.

GEOGRAPHICAL ASTRONOMY

Abriss der praktischen Astronomie, vorzüglich in ihrer Anwendung auf geographische Ortsbestimmung. Von Dr. A. Sawitsch, nach der zweiten russischen Original-Ausgabe. Neu herausgegeben von Dr. C. F. W. Peters. (Leipzig, 1879.)

AS may be inferred from the title of this work, the astronomical reader will not find it to be a general treatise on the practical branches of the science, but one confined to the theory and uses of instruments, and explanation of methods employed at the present day in the determinations of geographical positions. As such the name of its author, Dr. A. Sawitsch, the well-known Professor of Astronomy in the Imperial University of St. Petersburg, will give the work high recommendation in the estimation of the student. The two volumes of the original edition are now incorporated in one, and such modifications as have been rendered necessary by the introduction of new or improved forms of instruments, and refinements of observation and reduction have been introduced in a great measure by the author himself. In the opening chapter we have explanations of the various methods of reckoning time, and the transformation of one into another; the reduction of mean into apparent places, the calculation of refraction and parallax, and the influence of the earth's compression upon the geocentric co-ordinates of points upon the surface, with remarks upon angular measures in general, and upon the astronomical telescope and its adjustment, the microscopes, verniers, level, &c. In the first section, the author treats of the transit instrument, and enters into the various adjustments to which it is subjected, and also describes in some detail the universal instrument of Piston and Martins, and the errors of division to which instruments for angular measures may be liable. The second section is devoted to the determination of latitude and time by measure of zenith distance, of time from corresponding altitudes, &c. The third section enters more fully into the uses and theory of the transit instrument, and likewise describes Bessel's method for the determination of latitude thereby, supplying practical rules and an example. The next section treats of the determination of azimuth, and of the influence of diurnal aberration on the polar co-ordinates of a star. The fifth section contains a valuable outline of the various methods applicable to the determination of terrestrial longitude, including the telegraphic method, the transportation of chronometers, and longitude by observations of eclipses, especially those of the sun, and by lunar occultations.

The reference to the utility of eclipses for longitude-determination leads to an important chapter on Hansen's method for the calculation of the general circumstances of these phenomena upon the earth's surface, and the methods followed by Dr. Zech, in his researches on the historical eclipses; and, as a numerical example, the formulæ are applied to the computation of the circumstances of the total solar eclipse of August 18, 1887, to which frequent reference has been made in astronomical treatises. The data are founded upon the lunar tables of Hansen and the solar tables of Leverrier. Further, we have a discussion on moon-culminators in their application to longitudes, with notices on the methods of Nicolai and Struve, and a fully-worked-out example. The sixth section relates to the reduction of the longitude, latitude, and azimuth of a place to another, both accurately and approximately, and the determination of the distance of points on the terrestrial spheroid, of which the geographical positions are given. There are two supplementary chapters: the one bearing upon reflection-instruments, and of course entering at length into the use of the sextant; the other treating of interpolation, with special reference to the formulæ of Bessel and Hansen.

In the language in which this work originally appeared it would be almost a sealed book in Western Europe. The excellent translation into a language of which every scientific student should, in these days, possess a knowledge, now placed in our hands by Dr. Peters, will be, without doubt, a welcome addition to his means of instruction on an important branch of practical astronomy.

OUR BOOK SHELF

A Treatise on Dynamics of a Particle, with numerous Examples. By P. G. Tait and the late W. J. Steele. Fourth Edition. (London: Macmillan and Co., 1878.)

THE bibliography of this revised text-book is—a first edition in 1856, 304 pages; a second edition in 1865, 363 pages; a third edition in 1871, 428 pages; and the present edition of 407 pages. There are slight alterations in the disposition and amount of the matter in this edition, caps. x. and xi. of the third are put into cap. ix., caps. v. and vi. are contained in cap. v. of the fourth. The position of some of the exercises has been changed. The main features remain unaltered. The revision has had the advantage of Prof. Greenhill's supervision, who has verified (and corrected where necessary) the Examples and has freely introduced the use of Elliptic Functions. There is no need of any commendation for a text-book so well-known. We are, however, very much disposed to think that had Prof. Tait composed the work at a later date than he did, it would have differed somewhat from its present form and have approximated more closely to the Natural Philosophy brought out under the joint editorship of Sir William Thomson and himself. The author justly complains that "several sections in which some novelties appear have been translated almost *letter* for *letter* and transferred, without the slightest allusion to their source, to the pages of a German work. Several other books have obviously been similarly treated. It is well that this should be known, as the English authors might otherwise come to be supposed to have adopted these passages *simpliciter* from the German."

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